

## CLAIM AMENDMENTS

1           1. (Currently Amended) A magnetic recording system including a head, a magnetic  
2 media with perpendicular magnetic polarity transitions written thereon and circuitry adapted to  
3 receive a readback pulse with a substantially Lorentzian pulse shape from said head and to detect  
4 said substantially Lorentzian pulse shape, said head for transferring data between the magnetic  
5 media and an exterior environment, wherein said head is a planar head, said head comprising:  
6           a write element for inducing said perpendicular magnetic polarity transitions into a  
7 surface of said magnetic media during a write operation;  
8           a yoke having a read gap for sensing said perpendicular magnetic polarity transitions; and  
9           a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said  
10 magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse  
11 shape in response to one of said perpendicular magnetic polarity transitions.

2-16. (Cancelled)

1           17. (Currently Amended) A magnetic storage device comprising:  
2           a magnetic media having magnetic polarity transitions perpendicularly recorded thereon;  
3           a read element for reading said perpendicular magnetic polarity transitions, said read  
4 element including:  
5           a flux guide having a read gap, said read gap used for sensing said perpendicular  
6 magnetic polarity transitions and for producing a magnetic flux in said flux guide in response to  
7 each of said perpendicular magnetic polarity transitions, and  
8           a magnetoresistive element mounted in said flux guide for producing a readback  
9 pulse having a substantially Lorentzian pulse shape in response to said magnetic flux; and  
10           circuitry adapted to receive a readback pulse having a substantially Lorentzian pulse  
11 shape from said magnetoresistive element and to detect that said readback pulse has said  
12 substantially Lorentzian pulse shape, wherein said circuitry includes means for filtering said  
13 readback signal so that said readback signal has a greater resemblance to an ideal Lorentzian  
14 pulse shape.

18-29. (Cancelled)

1           30. (Currently Amended) A magnetic storage device comprising:  
2           a magnetic storage media;  
3           a head including a write element for inducing perpendicular magnetic polarity transitions in  
4           said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5           mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6           producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7           one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8           and  
9           circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10          from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11          detect Lorentzian pulse shapes, and said detector is a peak detector.

31-60. (Cancelled)

1           61. (New) A magnetic recording system including a head, a magnetic media with  
2           perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a  
3           readback pulse with a substantially Lorentzian pulse shape from said head and to detect said  
4           substantially Lorentzian pulse shape, said head for transferring data between the magnetic media  
5           and an exterior environment, said head comprising:  
6           a write element for inducing said perpendicular magnetic polarity transitions into a  
7           surface of said magnetic media during a write operation, wherein said write element comprises  
8           first and second write poles, and said first and second write poles have first and second cross-  
9           sectional areas, respectively, said second cross-sectional area being larger than said first cross-  
10          sectional area;  
11          a yoke having a read gap for sensing said perpendicular magnetic polarity transitions; and  
12          a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said  
13          magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse  
14          shape in response to one of said perpendicular magnetic polarity transitions.

1           62. (New) The magnetic recording system, as claimed in Claim 61, wherein said second  
2 cross-sectional area is about 10 to 100 times larger than said first cross-sectional area.

1           63. (New) A magnetic recording system including a head, a magnetic media with  
2 perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a  
3 readback pulse with a substantially Lorentzian pulse shape from said head and to detect said  
4 substantially Lorentzian pulse shape, said head for transferring data between the magnetic media  
5 and an exterior environment, said head comprising:

6           a write element for inducing said perpendicular magnetic polarity transitions into a  
7 surface of said magnetic media during a write operation;

8           a yoke having a read gap for sensing said perpendicular magnetic polarity transitions,  
9 wherein said yoke includes first, second and third pole pieces in a common plane with said read  
10 gap, said common plane being defined by masking during fabrication; and

11           a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said  
12 magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse  
13 shape in response to one of said perpendicular magnetic polarity transitions.

1           64. (New) A magnetic recording system including a head, a magnetic media with  
2 perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a  
3 readback pulse with a substantially Lorentzian pulse shape from said head and to detect said  
4 substantially Lorentzian pulse shape, said head for transferring data between the magnetic media  
5 and an exterior environment, said head comprising:

6           a write element for inducing said perpendicular magnetic polarity transitions into a  
7 surface of said magnetic media during a write operation, wherein said write element comprises a  
8 write pole having a leading edge, said leading edge and said read gap are separated by a distance,  
9 and said leading edge of said write pole is separated from said read gap by about 2 to about 3  
10 microns;

11 a yoke having a read gap for sensing said perpendicular magnetic polarity transitions; and  
12 a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said  
13 magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse  
14 shape in response to one of said perpendicular magnetic polarity transitions.

1 65. (New) A magnetic recording system including a head, a magnetic media with  
2 perpendicular magnetic polarity transitions written thereon and circuitry adapted to receive a  
3 readback pulse with a substantially Lorentzian pulse shape from said head and to detect said  
4 substantially Lorentzian pulse shape, said head for transferring data between the magnetic media  
5 and an exterior environment, said head comprising:

6 a write element for inducing said perpendicular magnetic polarity transitions into a  
7 surface of said magnetic media during a write operation;

8 a yoke having a read gap for sensing said perpendicular magnetic polarity transitions,  
9 wherein a length of said read gap ranges from about 0.1 to about 0.2 microns; and

10 a magnetoresistive read element mounted in a flux flow path of said yoke, wherein said  
11 magnetoresistive read element produces a readback pulse having a substantially Lorentzian pulse  
12 shape in response to one of said perpendicular magnetic polarity transitions.

1 66. (New) A magnetic storage device comprising:

2 a magnetic media having magnetic polarity transitions perpendicularly recorded thereon;  
3 a read element for reading said perpendicular magnetic polarity transitions, said read  
4 element including:

5 a flux guide having a read gap, said read gap used for sensing said perpendicular  
6 magnetic polarity transitions and for producing a magnetic flux in said flux guide in response to  
7 each of said perpendicular magnetic polarity transitions, and

8 a magnetoresistive element mounted in said flux guide for producing a readback  
9 pulse having a substantially Lorentzian pulse shape in response to said magnetic flux;

10 a write element for writing said perpendicular magnetic polarity transitions on said  
11 magnetic media, said write element including:

12 first and second write poles having first and second ends, respectively, said first  
13 and second ends located proximate to a surface of said magnetic media, wherein said first and  
14 second write poles comprise first and second cross-sectional areas, respectively, said second  
15 cross-sectional area being larger than said first cross-sectional area, and  
16 a coil element operatively coupled to said first and second write poles for writing  
17 to said magnetic media; and  
18 circuitry adapted to receive a readback pulse having a substantially Lorentzian pulse  
19 shape from said magnetoresistive element and to detect that said readback pulse has said  
20 substantially Lorentzian pulse shape.

1 67. (New) The magnetic storage device, as claimed in Claim 66, wherein said second  
2 cross-sectional area is about 10 to 100 times larger than said first cross-sectional area.

1 68. (New) The magnetic storage device, as claimed in Claim 66, wherein said write  
2 element is integral with said read element.

1 69. (New) The magnetic storage device, as claimed in Claim 66, wherein said read  
2 element is positioned within said write element.

1 70. (New) The magnetic storage device, as claimed in Claim 69, wherein said read  
2 element is physically smaller than said write element.

1 71. (New) A magnetic storage device comprising:  
2 a magnetic media having magnetic polarity transitions perpendicularly recorded thereon;  
3 a read element for reading said perpendicular magnetic polarity transitions, said read  
4 element including:  
5 a flux guide having a read gap, said read gap used for sensing said perpendicular  
6 magnetic polarity transitions and for producing a magnetic flux in said flux guide in response to  
7 each of said perpendicular magnetic polarity transitions, and

8 a magnetoresistive element mounted in said flux guide for producing a readback  
9 pulse having a substantially Lorentzian pulse shape in response to said magnetic flux;  
10 a write element for writing said perpendicular magnetic polarity transitions on said  
11 magnetic media, said write element including:  
12 first and second write poles having first and second ends, respectively, said first  
13 and second ends located proximate to a surface of said magnetic media,  
14 a coil element operatively coupled to said first and second write poles for writing  
15 to said magnetic media, and  
16 a non-magnetic spacer for substantially preventing flux flow through said write  
17 element during a read operation; and  
18 circuitry adapted to receive a readback pulse having a substantially Lorentzian pulse  
19 shape from said magnetoresistive element and to detect that said readback pulse has said  
20 substantially Lorentzian pulse shape.

1 72. (New) A magnetic storage device comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8 and  
9 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11 detect Lorentzian pulse shapes, and said detector is a class-4 partial response (PR4) detector.

1 73. (New) A magnetic storage device comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element

5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8 and

9 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11 detect Lorentzian pulse shapes, and said circuitry includes a high pass filter that receives said  
12 readback pulses and provides filtered readback pulses, which more closely resemble ideal  
13 Lorentzian pulse shapes than said readback pulses, to said detector.

1 74. (New) A magnetic storage device comprising:  
2 a magnetic storage media;

3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8 and

9 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11 detect Lorentzian pulse shapes;

12 wherein said magnetic storage device is devoid of a high pass filter between said  
13 magnetoresistive read element and said detector.

1 75. (New) A magnetic storage device comprising:  
2 a magnetic storage media;

3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-

7 one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8 and

9 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11 detect Lorentzian pulse shapes;

12 wherein said magnetic storage device is devoid of a differentiator between said  
13 magnetoresistive read element and said detector.

1 76. (New) A magnetic storage device comprising:

2 a magnetic storage media;

3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8 and

9 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11 detect Lorentzian pulse shapes;

12 wherein said magnetic storage device is devoid of signal processing circuitry between  
13 said magnetoresistive read element and said detector.

1 77. (New) A magnetic storage device comprising:

2 a magnetic storage media;

3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation,  
8 wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that



9 provides a read gap, said read flux guide is integral with and positioned within said write flux  
10 guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in  
11 said write flux guide and provide write poles that define said write gap, said first and second pole  
12 pieces are in said read flux guide and provide read poles that define said read gap, and said first,  
13 second and third pole pieces are substantially aligned with one another and define a plane that is  
14 substantially parallel to a top surface of said magnetic storage media; and

15 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
16 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
17 detect Lorentzian pulse shapes.

1 78. (New) A magnetic storage device comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation,  
8 wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that  
9 provides a read gap, said read flux guide is integral with and positioned within said write flux  
10 guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in  
11 said write flux guide and provide write poles that define said write gap, said first and second pole  
12 pieces are in said read flux guide and provide read poles that define said read gap, and said yoke  
13 includes a non-magnetic spacer in said write flux guide that prevents magnetic flux from  
14 circulating through said write flux guide during a read operation; and

15 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
16 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
17 detect Lorentzian pulse shapes.

1 79. (New) A magnetic storage device comprising:

2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation,  
8 wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that  
9 provides a read gap, said read flux guide is integral with and positioned within said write flux  
10 guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in  
11 said write flux guide and provide write poles that define said write gap, said first and second pole  
12 pieces are in said read flux guide and provide read poles that define said read gap, and said first,  
13 second and third pole pieces are part of an air bearing surface that floats above said magnetic  
14 storage media on a small cushion of air during read and write operations; and  
15 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
16 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
17 detect Lorentzian pulse shapes.

1 80. (New) A magnetic storage device comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation,  
8 wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that  
9 provides a read gap, said read flux guide is integral with and positioned within said write flux  
10 guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in  
11 said write flux guide and provide write poles that define said write gap, said first and second pole  
12 pieces are in said read flux guide and provide read poles that define said read gap, and said first,  
13 second and third pole pieces contact a lubricant on a top surface of said magnetic storage media

14 during read and write operations; and  
15 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
16 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
17 detect Lorentzian pulse shapes.

1 81. (New) A magnetic storage device comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation,  
8 wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that  
9 provides a read gap, said read flux guide is integral with and positioned within said write flux  
10 guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in  
11 said write flux guide and provide write poles that define said write gap, said first and second pole  
12 pieces are in said read flux guide and provide read poles that define said read gap, and said head  
13 includes write coils disposed between said first and third pole pieces but not between said first  
14 and second pole pieces; and  
15 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
16 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
17 detect Lorentzian pulse shapes.

1 82. (New) A magnetic storage device comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation,

8 wherein said yoke includes a write flux guide that provides a write gap and a read flux guide that  
9 provides a read gap, said read flux guide is integral with and positioned within said write flux  
10 guide, said yoke includes first, second and third pole pieces, said first and third pole pieces are in  
11 said write flux guide and provide write poles that define said write gap, said first and second pole  
12 pieces are in said read flux guide and provide read poles that define said read gap, and said head  
13 includes write coils disposed between said first and second pole pieces; and

14 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
15 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
16 detect Lorentzian pulse shapes.

1 83. (New) A tape drive comprising:  
2 a magnetic storage media;  
3 a head including a write element for inducing perpendicular magnetic polarity transitions in  
4 said magnetic storage media during a write operation, a yoke, and a magnetoresistive read element  
5 mounted in a flux flow path of said yoke and recessed from said magnetic storage media for  
6 producing readback pulses with substantially Lorentzian pulse shapes in response to and in one-to-  
7 one correspondence with said perpendicular magnetic polarity transitions during a read operation;  
8 and

9 circuitry adapted for receiving readback pulses with substantially Lorentzian pulse shapes  
10 from said magnetoresistive read element, wherein said circuitry includes a detector designed to  
11 detect Lorentzian pulse shapes.